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Effects of high hydrostatic pressure on cellular respiration monitored using phasor analysis of UV-excited autofluorescence[1] MARTIN HEIDELMAN, ANDREW I. RODRIGUEZ, MAX KREIDER, PAUL URAYAMA, Miami University — Pressure is known to affect many biological systems, including the structure and function of cellular membranes. Processes relying on membrane function, such as oxidative phosphorylation and cellular respiration, are sensitive to pressure. Here, we present results involving the real-time spectroscopic monitoring of cellular metabolism at high hydrostatic pressure (up to 40 MPa) using a microperfusion system capable of switching between two fluid reservoirs without depressurization. UV-excited cellular autofluorescence from reduced nicotinamide adenine dinucleotide (NADH) serves as the optical biomarker for the metabolic state of the sample with biophysical information contained in the spectral shape and intensity of the autofluorescence signal. Spectral shape is quantified using spectral phasor analysis. First, the cell's metabolic response to high pressure alone is characterized by cycling the pressure of the sample and examining the spectroscopic change. Results suggest that pressure-induced respiratory inhibition departs from a two-component behavior upon pressure cycling. Next, we compare this to chemically-induced respiratory inhibition (e.g., using ethanol and cyanide), allowing the effects of pressure to be further investigated.

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